



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

CONTRIBUTION TO THE KNOWLEDGE  
OF THE TERMITES.BY FRITZ MÜLLER.<sup>1</sup>

IN the opinion of profound students (Hagen in *Linnæa Entomologica*, 14, page 126) respecting the surprising multitude of different conditions which exist in Termite colonies, only the nymphæ with short wing-cases formed until now an insoluble mystery. As an introduction to the effort to bring this mystery nearer to a solution, I will mention some facts about the family life of the Termites. At a certain season (for different species differ) the winged males and females leave the nest in which, several weeks before, their last moulting has taken place, and raise themselves up in thick swarms in the air. After a short flight they sink to the ground, and rid themselves of their wings. During this begins the search of the male for a mate, and the successful pair try to get a nest for their eggs. Before they accomplish this intention, the majority of the defenceless animals are overwhelmed by the persecutions of the common ants, the birds, and other enemies. Only after a pair as king and queen have found admission in a nest follows a true matrimonial state, during a year, as the result of a betrothal celebrated outside of the nest. The fructification takes place neither in the air nor at all outside of the nest. This representation agrees in nearly essential points with that which Smeathman has given nearly one hundred years ago (1781), but the later zoological books seem to differ from it. Some writers seem to think that the Termites couple (copulate) in the air, or at least, outside of the nest, and that the males perish afterward, and the fructified females are brought back into the nest.

That the male with his female return again to the nest, and live as king and queen, needs no further proof, for besides Smeathman, Lavage, Lespes, Bates, and others have found such kings with different species. Also, later, Dr. Hagen declares

<sup>1</sup>Translated from the German by Mrs. Lucy Bronsen Dudley.

that the existence of such a king appears certain beyond doubt, from the manifold statements of reliable observers, and from numerous specimens of such nest-dwellers (Hagen 12, page 16, and at other places). And I also have found the king with eight or nine species of the genus *Calotermes* (*rugosus*, *nodulosus*, *hagenii*), *Termes lespesii*, *Eutermes inquilinus*, *Anoplotermes pacificus*, and others.

At the time of the swarming the reproductive organs are very small; after the return to the nest they grow so large that they fill the greater part of that sometimes much-swollen hinder part of the body. So there is no doubt about the probable, often-repeated fructification in the interior of the nest; by this, of course, a former fructification outside of the nest is not excluded, though it is very uncertain at the time of the swarming, for the reproductive organs (testicle and ovary) are then so little developed. Burmeister could not discover the interior reproductive parts of the winged animals, even of one of the larger species (*Termes dirus*); and also Dr. Hagen examined many (alcohol) specimens of winged Termites without finding reproductive organs. (Communication by letter of Nov. 25th, 1871.)

Some even take the majority of a Termite swarm as sterile individuals. By this it can be understood how small the reproductive parts of the winged animals are in comparison to their later enormous circumference; for example, I will state that with the winged males of our largest *Eutermes* species the reproductive organ (testicle) is scarcely 0.3 mm. in diameter. If the Termites possessed the seed-thread of the other insects, so striking to the eye as scarcely to be mistaken, then would the question be easy enough to decide whether the winged males would be able to fertilize the females outside of the nest. In mature kings (sexual males) of different species I found in the reproductive organ (testicle), only partly larger, very pale, roundish little bodies of about 0.008 mm. in diameter (with *Eutermes vernalis*, masculine) which seem to be without a cover. If water is added it increases in size as large again as before. Partly smaller ones, pretty strong and light-refracting little balls, have been found, scarcely 0.002 mm. in diameter. The former are probably the

fructificating ingredient of the semen. They are so pale, and their form is differentiated so little, that I cannot say with precision whether they are found with the winged males. I have until now looked in vain in the reproductive organ (semen pocket) of the queens, as well as in that of the winged females. If I have rightly seen, those with the winged males (the large-ball, nest-building *Eutermes*) already exist, but still enclosed in cells.

Until now, a couple of Termites have not been caught in the act of fructification (copulation). What may have been taken for it are the pleasure walks of the couples, many times observed, which they take together, the female in front and the male close behind, often seizing the hinder body of the female with his mandible. These peculiar walks have I seen repeatedly with the species *Termes lespesii*. Of this kind I brought matured individuals (imago) out of the nest into a glass. They seemed to have the habit, after a short restlessness, to become heaped over each other in thick layers, as they had been accustomed to sit quietly at the bottom in the chambers of the nest. I poured them on a sheet of paper, and they pushed themselves gradually, one couple after the other, out of the crowded heap, so as to get slowly away from the heap.

Some couples, however, separated themselves soon again; these were two males, as far as they could be examined. The others, which kept together, consisted always of a female in front and a close-following male; the latter was up to the hinder half of the wing, or in case the wings had been already thrown off, completely hidden under the wings of the female. If it was sometimes a step backward, the female seemed to wait for it. Not seldom had the male really seized for a time, with his mandibles, the point out of the hinder body of his mate (as Rosenschold gives, and not apparently, as Lespes saw with *Termes lucifugus*). It seemed to be a sort of bridal caressing. Of fertilizing I have seen as little as Smeathman, Rosenschold, Lespes, Tollin, and others. The object of these pleasure walks is probably to find a nest for a new home for their species.<sup>2</sup>

<sup>2</sup> Mènètriès relates, in a curious report of mixed truth and error (Linn. Entomologica, page 116), that these pleasure walks ended with fertilization.

I believe this statement is doubtful, just as much as that of the Termites of Serra da

I would pass over in silence the pretended congress (copulation) in the air if Azara and Rengger had not claimed to have seen the same in Paraguay, and they rightfully have the reputation of good, reliable observers. In this instance of the Termites, however, they have not justified this reputation, for Azara gives the Termites six wings, and Rengger found the ground covered for fifteen minutes with male Termites, or at least their wings. Unfortunately he says just as little as to how he could make out the wings to belong to males, as in what way the copulation in the air took place.

Rosenschold relates, also, that out of the thick swarms of an indigenous kind the animals fall down in couples, so that the above-mentioned pleasure walks may begin. With the poor ability to fly, and the deficiency of reproductive organs of the Termites, the copulation in the air I think to be distinctly impossible. So much in justification of the statements of Smeathman, as against the different opinions of scientific zoologists. His representations of the reproductive (sexual) life of the Termites seems—as far as I can judge from the facts collected in Hagen's monograph—to be exactly right from my own experience. However, this point is yet incomplete for many other species, if not for those observed by Smeathman (*Termes bellicosus*). It finds therein no consideration for nymphæ with short wing-cases, or better wing beginnings.<sup>3</sup> These animals have been ob-

Mantiquera denuding the trees of the foliage to carry the leaves to their nest is probably a mistake (with ants of the species *Ecodoma*); that the males of these Termites have stronger mandibles than the females, and that the latter already in the first two or three days after their return home lay their eggs. With other species at this time quite unripe eggs are thrown out of the nest, and some places in Brazil roasted mandioc roots furnish the chief nourishment of the inhabitants, etc. Mènètriès never found, 'during a five years' sojourn, a Termite in really virgin forests in different provinces of Brazil, which probably all together have more Termites than our St. Catherine's. In my own native forest live more than a dozen species.

<sup>3</sup> The name wing-cases is applicable only for the oldest nymphæ which have passed beyond their wing beginnings. Real wing-cases will be developed at the next moulting, and are not present in cases where the wings are not developed.

Dr. Hagen is correct (Linn. Ent. 14, page 126) in blotting out the so-called short wing-cases of the soldier nymphæ from the line of forms of the Termites as very unwarranted. But there are soldiers with wing attachments, out of which wings ought to become veloped; if not soldiers at all, remain wingless (Hagen and at other places, page 102); just as those described by Dr. Hagen as soldiers of the *Termes* (*Termopsis*?) *occidentalis* Walker, and those of the *Calotermes smeathmanii*.

served many times, and were first described by Lespes particularly. The same difference is found among the nymphæ of *Termes lucifugus*, which he observed with two different forms in Bordeaux.

The nymphæ of the first form are livelier, thinner, and have long and broad wing beginnings quite covering the front part of the hinder body. They begin to color the first of May, and change themselves into winged animals between the 15th and 20th of May.

The nymphæ of the second form are more seldom found; they are thicker, more clumsy, and have small short wing beginnings placed sideways. In February, as Lespes first found them, these second nymphæ had the same size as the other (6 to 7 mm.); later they become larger (8 to 10 mm.); but the hinder part of the body grew considerably, particularly in the females. The rear part has grown so fast that the back shields do not continue to cover the sides, but become divided on top by a soft skin. With this swelling of the hinder body is correspondingly a stronger development of the procreative organs. The female nymphæ of the first form had shortly before the last moulting, in each ovary, perhaps twelve tubes, of which only two or three contained unripe eggs. On the contrary, with the nymphæ of the second form, were found as many as fifty-six tubes in which the eggs became visible with older nymphæ. Also the male procreative organs were much more developed in the second form, and the nymphæ outlive the transformation and the swarming of the others, and grew on as nymphæ. They only begin to turn brownish in July, and always become at this time more rare. The observations of Lespes unfortunately only reached to this season. He supposes that the nymphæ of the second form change to winged males and females, and swarm in August, and that out of them come forth a king and queen.

While the smaller couples of wingless males and females are derived from the nymphæ of the first form, these he sometimes found in the nests of *Termes lucifugus*, and called them "little kings and little queens." This conclusion is reached only on account of the development of the procreative parts of king and queen as compared to those with the nymphæ of the

second form, and the development of the procreative parts of the "little king and little queen," as compared with those of the nymphæ of the first form. These different magnitudes, and these different developments of the procreative organs of the captured kings and queens of Lespes may be explained by supposing that they belong to growths of the different years.

Dr. Hagen has already said—against this conclusion of Lespes—that in all kings and queens examined until now, the wing-scales show exactly the form and size of the imago. This development cannot be brought at all in harmony with the little rudimentary wing-cases of those nymphæ. It seems also improbable that these nymphæ with their last moulting may draw out of the rudimentary sheath only wing-scales. So much the more, as the scales of a royal pair every time show exactly the places from where the wings are broken. Besides, the prothorax of the queen never differs in form from that of imago; while the nymphæ of the second form are distinguished by a broader prothorax. When in July the nymphæ of the second form begin to turn brown, as their last moulting was near at hand, in case they had to undergo one, their wing beginnings were still so small that it was impossible that out of them could become developed wings such as those animals possess which swarm in May. Even if they would get such wings, they would not be able to fly on account of their thick hinder bodies, as every one will agree who has seen living Termites.

The observations of Robe-Moreau, beginning in 1797 (his memoirs on the Termites observed by Rochefort, etc., appeared 1843), and who has given long years of observation to the Termites in and around Rochefort, met "delayed nymphæ" after the swarming time, which he supposed did not undergo a further change, as a second swarming had never been observed in Rochefort.

Dr. Hagen thinks that Robe-Moreau and Lespes have examined the same species, while Lespes believes that the *Termes lucifugus* of Bordeaux are different from those of Rochefort. However it may be, it seems to me there is scarcely a doubt that in Bordeaux there does not take place a second swarming of

males and females derived from the nymphæ of the second form. That rather these nymphæ remain wingless, and never leave their nests in which they develop themselves under conditions into males which can beget offspring, and into females which can lay eggs. These nymphæ, like mature animals, are already observed with several species; and have been usually described as queens. Joly illustrated a queen of *Termes lucifugus*, without wing-cases, and Lespes reports that Joly assured him also that the same had been seen without a trace of wing-cases. Besides, Burmeister described a female of *Termes flavipes* as a wingless queen, and Dr. Hagen, who examined the same animal, found it had about the same habit as a queen with the short wing-sheaths of a nympha. He also considers Bates' queen of *Termes arenarius* as a nympha with undeveloped wing-sheaths. (Communicated by letter of January 2nd, 1872.)

Further, I take here in consideration a specimen of *Calotermes flavicollis* which is in the British Museum, described by Walker among *Termes lucifugus*, a nympha with short wing-cases, deceptively like an imago which has lost the wings. The uniform black color, the shining polished head, thorax and body, exclude the idea of another moulting. (Dr. Hagen 12, pages 20 and 59, and at other places.) Therefore the males and females of certain species of Termites appear under two different forms.

The ones arising out of the nymphæ of the first form receive wings, and leave their birthplace in swarms. Only very few lucky ones among them are so successful as to ascend later a vacated throne as king and queen. The others, which have become the matured nymphæ of the second form, never see the light of day; they remain wingless, and never leave the nest in which they have grown.<sup>4</sup> Of what importance is now the preservation and the success of the species of each one of these two forms? A large

<sup>4</sup> Dr. Hagen writes me that all queens (of *Termes bellicosus*, *dives*, *obesui*, *gilvus*) which he saw, from Asia and Africa, are really imagines with the wing-stumps from which the wings are broken. On the contrary, all queens (of *Termes flavipes*, *morio*(?) *similis*(?) *arenarius*) which he had seen from Brazil and America were decidedly nymphæ. So striking this fact may seem, it would be hasty judgment to conclude from it that in the occurring of both forms there exists a difference between the old and new worlds. I have seen here more than a hundred real queens, more than Dr. Hagen, from Asia and Africa, before I found for the first time nymphæ-like females.



Termite colony sends out yearly over a hundred thousand winged males and females, for the purpose of receiving back a single royal pair every two, three, or four years.

The destruction made among these quite defenceless animals are numerous, from man to the common ant. As the difficulties are so great after the bride and groom have selected each other, and reached the nest for which a royal pair is wanted,—would it not seem more simple and more sure to keep all males and females well protected at home? What an amount of work would the Termites be spared if they did not have to bring up, year after year, those cloud-like swarms of winged animals which ascend from the large hill-nests.<sup>5</sup>

Is it not striking that with all species, wherever they may exist, a simpler and surer way has not been found which should spare so much work, by developing through nymph-like males and females, by the way of natural selection?

Whenever one meets such questions, one may usually take Darwin, and hope to find the key of the solution. In this way, whoever occupies himself with this subject will find recorded in the 17th chapter of his book on “The Variation of Animals and Plants under Domestication,” evidence which he will scarcely object to acknowledge has made in the highest degree probable, if not proved, the conclusion with which Darwin closes the chapter: “That the crossing of animals and plants which are not closely related to each other is highly beneficial, or even necessary, and that inter-breeding prolonged during many generations is highly injurious.”

Now with the majority of the Termite species of which sociable conditions are known, every colony possesses, with rare exceptions, a single royal pair, or sometimes a single king with two consorts. Therefore all in this state are grown-up males and females, brothers and sisters. The exclusive propagation through indigenous

<sup>5</sup> Rengger, Tollin, and others have spoken of the building up of new colonies by the swarming males and females, and reached the idea therefore that swarming would be absolutely necessary. I will not directly deny the ability of the males and females of *Calotermes* to go on living further in their own way, and to begin a new settlement. With all species of *Termes*, *Eutermes*, *Anoplotermes*, of which the way of living I know to some degree, a winged pair would undertake the foundation of a new state with exactly the same success as a pair of new-born children which one had set out on a desert island.

males and females would lead to the most narrow and limited marrying into the same family. During the out-swarming the males and females of different colonies can find each other, whose union here, as elsewhere, will produce a stronger offspring.

With the numerous exterminations, through diverse enemies, which the Termites undergo while swarming, it will occur that a colony is not able to fill its throne in due time with a new royal pair, in spite of their infinite number. In this case of need nymph-like males and females, safely kept in the nest, step in as substitutes, and save the colony from becoming extinguished.

From the circumstance, that only then these reserved males and females become necessary, if no real royal pair has been found after the close of the swarming time, the delayed developments of the nymphæ of the second form may be explained. Lespes reports that these nymphæ of the second form always become more rare the nearer the time of their changing approaches (only supposed, not observed). Dr. Hagen reports of the work of Lespes (12, page 317, and other places), that it would be certainly highly strange if the same really changed into winged animals for a second swarming.

It seems comprehensible that they are gradually allowed to die out by starvation when not needed, or that only so many are kept alive as are necessary. In a surprising way these conditions exist alike in the Termites as in the plants of the most different families, in the observed facts of closed blossoms (cleistogami Kuhn).<sup>6</sup>

As there develop on certain plants, besides open ones, the cross-fertilizing blossoms of different plants, so others are found developed which never open themselves (cleistogama), of which the stamens and pistils always remain enclosed, and by which the preservation of the species becomes assured in case the fructification depending on outside conditions does not take place through open blossoms.

In the same way certain Termite colonies develop beside the out-swarming and crossing of different colonies, through other

<sup>6</sup> Compare Hildebrand, *The Distribution of Sexes in Plants*, 1867, page 73. Severin Axell, *Fanerogama Vaxternas Fructifij*, 1869, pages 10 to 76.

never-swarming (cleistogamic) males and females, which always remain locked up in stock, and through which the preservation of the species becomes assured, in case the fructification of out-swarmling males and females, depending on the favor of outside conditions, does not take place.

As the cleistogamic blossoms of many plants are to young buds of the opened blossoms, so are the cleistogamic males and females of the Termites alike in reproduction to the out-swarmling. With the plants the leaves of the flowers remain, with the Termites the wings remain, in a lower state of development. The lavish production of flower-pollen in open flowers corresponds with the lavish production of winged males and females; as the limited number of nymphæ with short wing beginnings to the more scanty pollen of cleistogamic blossoms. As the cleistogamic blossoms of the violet unfold to open ones, so in *Termes lucifugus* the nymphæ of the second form develop later than those of the first form.

In the foreign *Leersia oryzoides* in France, fructification has been so far only observed to take place by means of cleistogamic blossoms, so until now in the garden in Schönbrun only one cleistogamic female has been found of the *Termes flavipes*, probably because in both cases, in a strange land, the outside conditions are not favorable for the usual fructification.

I had formed this opinion about the nymphæ with short wing-cases, the same as that in Dr. Hagen's monograph, from the facts there laid down, and stated in letters, long before I had the opportunity to see such animals.

Unfortunately the real kernel of this standpoint lacked the real foundation,—the proof failed,—that really cleistogamic males and females took charge of the transplanting of the species in cases where king and queen failed in stock.

One will comprehend with what joyful surprise I greeted a discovery which allows me now to furnish this proof.

I had (on the 11th of November) brought home with me the firm kernel (of a *Eutermes* nest), about the size of a hen's egg, out of decayed Gissara stump. Around the kernel were heaped considerable masses of eggs, and so I expected to find therein,

as usual, a royal pair. But instead of a large royal room enclosed in the middle part, the whole kernel was as a sponge, with irregular ways leading all through it. In these passages sat here and there not less than thirty-one compensating females,—five or six pressed tight together, with short wing beginnings (Fig. 1); six or eight mm. long. Among them only a single king walked around, of nearly the same size, and indeed an actual king, with large black eyes, and the wings were broken off from the wing-scales.

A queen was lacking.

Instead of a royal palace in which a king lived in chaste matrimony with his equal consort, I had a harem before my eyes, in which a sultan satisfied himself with numerous coquettes.<sup>7</sup>

In course of a day these supplementary females laid a pretty large number of eggs, which were carried into little heaps by the workers. The same wave-like contractions, as with the queens, could be seen, and I saw with several the extrusion of an egg.

The color of these females with short wing beginnings is a light brown, by which they are distinguished, as much from the pale, nearly colorless workers, as from the great deal darker-colored king. As a whole they look pretty much like the workers, more alike than to any other forms of their kind, only they are twice as large. Their wing beginnings are with most of them too small to be noticed, by a not very careful observation. Their hinder body, only slightly swollen, has about the same oviform figure, and stands about in the same relation to the whole length as that of the worker. The likeness of the head (Fig. 2)

<sup>7</sup> It may be supposed that Bofinet had already seen a similar company of supplementary females of *Termes lucifugus*. There were seven of them in the middle of a beam or joist. They were eight by ten mm. long, nearly white or very light red. Near them were found several egg heaps and very numerous larvæ, enough therewith to fill a litre. Compare Dr. Hagen's report (10, page 130, and other places).

Lespes had found in *Termes lucifugus* only a single royal pair, and the bright color of those found by Bofinet is not characteristic of the real queens.

When Dr. Hagen (12, page 177, and other places) supposed that Lespes might have seen no queens at all, but only large nymphæ of the second form, contradicting the assurance of Lespes (page 332, and at other places), expressly accentuated by Joly, that the wing-scales of his queens were always present. In the different measurements by Bofinet, Joly, and Lespes I can find no objection, as the females only grow up gradually from that of the imago to the fabulous size which has made the queens of the Termites so celebrated, and one can find all the sizes that lie between.

is especially striking. The clear cross lines which generally distinguish the head of the *Eutermes* worker are with most of these females scarcely less distinct than with the workers. (Hagen 12, page 187, and at other places). The antennæ have fourteen joints, as those of the worker, while the soldiers have but thirteen, and the winged animals have fifteen. The head could be taken for that of a worker if it were not for their little round faceted eyes, which, however, are scarcely raised above their surroundings, and are somewhat a slightly darker color.

I have not observed ocelli. The prothorax resembles that of the worker—it has a saddle-formed depression, going cross-wise, which separates a forward flap, and this flap is very large with the worker, steep, turned upwards, and not deeply carved in the middle of its front edge. With the supplementary females it is only small, and was simply rounded off, and goes up slightly. The size of the forward lap changes, however, with some few samples, and it was reproduced by a small seam, and then the prothorax resembled that of the king. The wing beginnings take the whole lateral borders of the meso- and meta-thorax (Pl. XXXIV., A); mostly they are scarcely half so long as these body wings, broad and then triangular, horizontal to the outside directed projections of which the forward edge goes obliquely to the background; with very few samples (Pl. XXXIV., B) the wing beginnings are considerably longer; also the meso- and meta-thorax are in this case a great deal more strongly developed. The oblique to reverted wing beginnings cover the forward edge of the hinder ones. The belly shields are formed as with the winged females. The internal reproductive organs (Fig. 3) are nearly like those of the winged females, for the reason that they hold eggs. Every ovary seems to have about half a dozen, and the egg-tubes about a dozen, for every ovary (the number seems to be rather variable), and are placed in clusters, as with the winged females, on the end of a short oviduct, while with the full-grown queen every ovary forms a long tube, that in the whole length is covered thickly with extraordinary numbers of egg-tubes. The seed pocket and albumen glands have the usual

form. A queen 19 mm. long, which weighed about 0.2 grammes, is equal in weight to fifteen supplementary females. The ovaries of all the thirty-one supplementary females may together scarcely weigh as much, and furnish hardly as many eggs, as those of a single older queen.

Lespes and Dr. Hagen also found male nymphæ with short wing beginnings, so the king may probably just as well be substituted by supplementary males as the queen by supplementary females. Does such a substitution take place in a nest at the same time for both sexes? out of those eggs of the supplementary females fertilized by the supplementary males develop all forms which compose the Termite population? or are only workers and soldiers; and are, of all species, in all colonies, regularly each year, nymphæ with short wing beginnings produced?

These are questions which I cannot answer now with certainty. The exact solution may require observations continued for years.

*Supplement.*—Bates, Lespes, and also myself found the youngest larvæ of the different classes occurring in the Termite family undistinguishable.

Before they reach half the length of the grown-up worker, they separate themselves by the first indication of the wing-cases.

From the larvæ of the later, able to become reproducing animals, those of the soldiers and workers are distinguished by their thicker heads, as also in *Termes saliens* and others.

Only a short time before the last moulting are the larvæ of the soldiers distinguishable from those of the workers, however different both may be in grown-up condition. A single exception only has been observed by Bonifit of a soldier which was so small that it as such seemed to have left the egg.

If the difference in sexes is not taken into consideration, that of the two-fold forms of the workers and soldiers which seems to occur with some species, may be expressed in the following statement which is made for the Termite states (or colonies) of the species *Termes* and *Eutermes*.

# PLATE XXXIV.

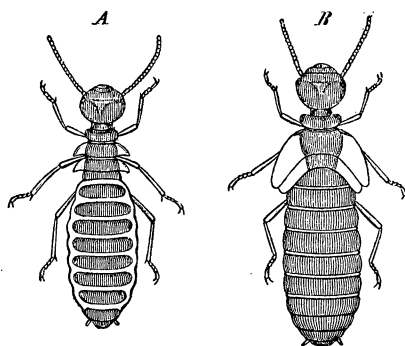


Fig. 4.

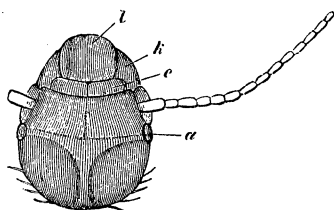


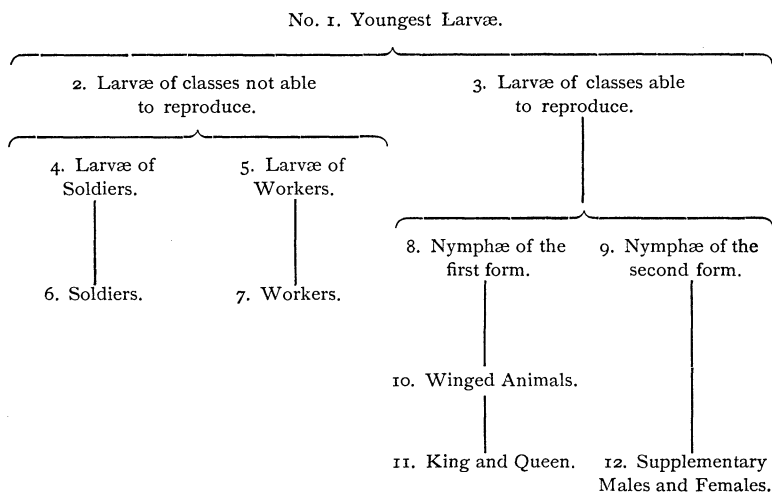
Fig. 2.



Fig. 3.

*Termes lucifugus.*

# TABLE OF DEVELOPMENT.



## DESCRIPTION OF PLATE XXXIV.

FIG. 1.—Two compensating females of *Termes lucifugus*. *A*, The usual form, with short wing beginnings; *B*, the more uncommon form, with longer wing beginnings.

FIG. 2.—Head of a compensating (or supplementary) female. *a*, Both small faceted eyes; *l*, the upper lip; *k*, the upper jaw.

FIG. 3.—Sexual parts of a compensating (or supplementary) female; *s*, semen pocket; *k*, albumen glands.